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XII.

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Box 1

INDEX LECTIONUM

IN

LYCEO REGIO HOSIANO BRUNSBERGENSI

PER HIEMEM

ANNI MDCCCXXXI—II A DIE XVII. OCTOBRIS

INSTITUENDARUM.

PRAEMISSAE SUNT D. L. FELDTII NONNULLARUM FORMULARUM DIFFERENTIALIUM E THEORIA MOTUS CORPORUM COELESTIUM EVOLUTIONES.

BRUNSBERGAE,
TYPIS MUTTRAYANIS.

31/32

Seinem Freunde
dem Herrn Stadtrath ...
in Breslau

LYCEI REGII HOSIANI BRUNSBERGENSIS

RECTOR ET SENATUS

CIVIBUS SUIS.

S.

Praestantissimum Theoriae motus Opus, in quo vir acer et ingeniosus Gaussius de principio gravitationis universalis, a summo Newton detectum, egregie ita disputat: „Systema gravitationis universalis novos analysi triumphos eosque splendidissimos paraverat; cometaeque usque ad illum diem semper indomiti, vel si devicti videbantur mox seditiosi et rebelles, frena sibi iniici passi, atque ex hostibus hospites redditi, iter suum in tramitibus a calculo delineatis prosequuti sunt, iisdem quibus planetae legibus aeternis religiose obtemperantes", quaedam singularia de variationibus differentialibus ad locum simplicem in spatio spectantibus, suppressa demonstratione exhibet, quae dum ingenium acuunt et exercent imaginandi vim simul magnopere oblectant. Ea, Cives ac Commilitones nobilissimi, breviter in hoc lectionum indice attingam, plura huc spectantia vel affinia alio iam tempore daturus.

I.

Variationes differentiales inclinationis orbitae ad planum novum, distantiae nodi ascendentis orbitae in plano novo a nodo ascendente plani novi in ecliptica, arcusque secundum directionem motus.

Retinebimus characteres $\Omega - n$, Ω' Δ, i' $180^\circ - i$, ε in eadem significatione, in qua a Gaussio accepti sunt; longitudinem nodi ascendentis orbitae in ecliptica scilic. denotabimus per Ω, inclinationem per i; longitudinem nodi ascendentis plani novi in ecliptica per n, inclinationem per ε; distantiam nodi ascendentis orbitae in plano novo

a nodo ascendente plani novi in ecliptica per Ω', inclinationem orbitae ad planum novum per i'; arcum denique ab Ω ad Ω' secundum directionem motus per $\varDelta$ (conf. Theor. mot. libr. I. sect. II. art. 55.): erunt trianguli sphaerici

latera	ang. oppositi
$\Omega - n$	i'
Ω'	$180° - i$
$\varDelta$	ε

Ex analysi trigonometrica iam vero notum est, in triangulo quolibet sequentem se prodere aequalitatem

$$\cos\varDelta = \cos\Omega'\cos(\Omega - n) + \cos\varepsilon\sin\Omega'\,\sin(\Omega - n)$$
$$\cos\Omega' = \cos\varDelta\cos(\Omega - n) + \cos(180° - i)\sin\varDelta\sin(\Omega - n)$$
$$\cos(\Omega - n) = \cos\Omega'\cos\varDelta + \cos i'\sin\Omega'\sin\varDelta.$$

Differentiando aequationes praeced., omnibus i', i, ε, $\Omega - n$, Ω', $\varDelta$ pro variabilibus habitis, nanciscimur:

$$[\alpha]$$
$$\sin\varDelta\, d\varDelta = \left\{ \begin{array}{l} +[\sin\Omega'\cos(\Omega - n) - \cos\varepsilon\cos\Omega'\sin(\Omega - n)]\, d\Omega' \\ +[\cos\Omega'\sin(\Omega - n) - \cos\varepsilon\sin\Omega'\cos(\Omega - n)]\, d(\Omega - n) \end{array} \right. + \sin\varepsilon\sin\Omega'\sin(\Omega - n)\, d\varepsilon,$$

$$[\beta]$$
$$\sin\Omega'\, d\Omega' = \left\{ \begin{array}{l} +[\sin\varDelta\cos(\Omega - n) - \cos(180° - i)\cos\varDelta\sin(\Omega - n)]\, d\varDelta \\ +[\cos\varDelta\sin(\Omega - n)\cos(180° - i)\sin\varDelta\cos(\Omega - n)]\, d(\Omega - n) \end{array} \right. + \sin(180° - i)\sin\varDelta\sin(\Omega - n)\, d(180° - i),$$

$$[\gamma]$$
$$\sin(\Omega - n)\, d(\Omega - n) = \left\{ \begin{array}{l} +[\sin\Omega'\cos\varDelta - \cos i'\cos\Omega'\sin\varDelta]\, d\Omega' \\ +[\cos\Omega'\sin\varDelta - \cos i'\sin\Omega'\cos\varDelta]\, d\varDelta \end{array} \right. + \sin i'\sin\Omega'\sin\varDelta\, di',$$

sive per evolutiones notas introducendo

$$\cos i'\sin\varDelta = \sin\Omega'\cos(\Omega - n) - \cos\varepsilon\cos\Omega'\sin(\Omega - n),$$
$$\cos(180° - i)\sin\varDelta = \cos\Omega'\sin(\Omega - n) - \cos\varepsilon\sin\Omega'\cos(\Omega - n),$$
$$\cos i'\sin\Omega' = \sin\varDelta\cos(\Omega - n) - \cos(180° - i)\cos\varDelta\sin(\Omega - n),$$
$$\cos\varepsilon\sin\Omega' = \cos\varDelta\sin(\Omega - n) - \cos(180° - i)\sin\varDelta\cos(\Omega - n),$$
$$\cos\varepsilon\sin(\Omega - n) = \sin\Omega'\cos\varDelta - \cos i'\cos\Omega'\sin\varDelta,$$
$$\cos(180° - i)\sin(\Omega - n) = \cos\Omega'\sin\varDelta - \cos i'\sin\Omega'\cos\varDelta,$$

statuendoque adhuc in prima $[\alpha]$ $\sin i' = \frac{\sin\varepsilon\sin(\Omega - n)}{\sin\varDelta}$, in secunda $[\beta]$ $\sin\varepsilon = \frac{\sin(180° - i)\sin\varDelta}{\sin\Omega'}$, in tertia $[\gamma]$ $\sin\varepsilon = \frac{\sin i'\sin\varDelta}{\sin(\Omega - n)}$, omnibus rite collectis tandem eruitur:

$$[\delta]\quad d\,\Delta = \cos i'\, d\,\Omega' + \sin i' \sin \Omega'\, d\,\varepsilon + \cos(180^\circ - i)\, d\,(\Omega - n),$$

$$[\eta]\quad d\,\Omega' = \cos i'\, d\,\Delta + \cos \varepsilon\, d\,(\Omega - n) + \sin \varepsilon \sin(\Omega - n)\, d\,(180^\circ - i),$$

$$[\chi]\quad d\,(\Omega - n) = \cos \varepsilon\, d\,\Omega' + \sin \varepsilon \sin \Omega'\, d\,i' + \cos(180^\circ - i)\, d\,\Delta.$$

E quibus aequationibus iam absque negotio inveniuntur variationes differentiales ipsarum i', Ω', Δ, quatenus a variationibus ipsarum Ω—n atque ε pendent. — Ecce evolutionem nostram harum formularum.

1. Ex aequationibus $[\delta]$ et $[\chi]$ eliminando $d\,\Omega'$ formulae $[\eta]$ beneficio, sed spectando i ut quantitatem constantem h. e. ponendo $d\,(180^\circ - i) = 0$, peracta adhuc substitutione in $[\chi]$ $\cos \varepsilon \cos i' + \cos(180^\circ - i) = \cos \Omega' \sin i' \sin \varepsilon$, omnibus rite ordinatis, formulae $[\delta]$ et $[\chi]$ ita se habebunt:

$$d\,\Delta = \frac{\cos i' \cos \varepsilon\, d\,(\Omega - n)}{\sin^2 i'} + \frac{\cos(180^\circ - i)}{\sin^2 i'}\, d\,(\Omega - n) + \frac{\sin \Omega'}{\sin i'}\, d\,\varepsilon,$$

$$\sin^2 \varepsilon\, d\,(\Omega - n) = \cos \Omega' \sin i' \sin \varepsilon\, d\,\Delta + \sin \varepsilon \sin \Omega'\, d\,i',$$

e quarum combinatione iam prodit:

$$[\varphi]\quad d\,i' = \left[\frac{\sin^2 \varepsilon \sin^2 i' - \cos \Omega' \sin i' \sin \varepsilon\, [\cos i' \cos \varepsilon + \cos(180^\circ - i)]}{\sin^2 i' \sin \varepsilon \sin \Omega'}\right] d\,(\Omega - n) - \cos \Omega'\, d\,\varepsilon,$$

atque hinc, ponendo $\cos i' \cos \varepsilon + \cos(180^\circ - i) = \cos \Omega' \sin i' \sin \varepsilon$, aequatio $[\varphi]$ in hanc abit:

$$d\,i' = \frac{\sin \varepsilon}{\sin \Omega'}[1 - \cos^2 \Omega']\, d\,(\Omega - n) - \cos \Omega'\, d\,\varepsilon,$$

quam etiam hunc in modum repraesentare licet:

$$d\,i' = \sin \varepsilon \sin \Omega'\, d\,(\Omega - n) - \cos \Omega'\, d\,\varepsilon.$$

Quae formula iam eadem est, quae invenitur in: Theoria motus corpor. coelest. pag. 54. art. 57.

2. Similes ob rationes, ponendo $d\,(180^\circ - i) = 0$, aequatio $[\eta]$ fit

$$d\,\Delta = \frac{d\,\Omega'}{\cos i'} - \frac{\cos \varepsilon\, d\,(\Omega - n)}{\cos i'}.$$

Substituamus nunc valorem ipsius $d\,\Delta$ in aequatione $[\delta]$, invenitur:

$$d\,\Omega' = \left[\frac{\cos \varepsilon + \cos i' \cos(180^\circ - i)}{\sin^2 i'}\right] d\,(\Omega - n) + \frac{\cos i' \sin \Omega'\, d\,\varepsilon}{\sin i'},$$

atque hinc, statuendo $\cos \varepsilon + \cos i' \cos(180^\circ - i) = \sin i' \sin i \cos \Delta$, iam sponte sequitur

$$d\,\Omega' = \frac{\cos \Delta \sin i}{\sin i'}\, d\,(\Omega - n) + \frac{\sin \Omega'}{\tang i'}\, d\,\varepsilon.$$

3. Eadem analysi et tertia formula Theor. mot. h. e. $d\Delta$ invenitur. Aequatio scilicet [δ]

$$d\Delta = \cos i' \, d\Omega' + \cos(180^\circ - i)\, d(\Omega - n) + \sin\Omega' \sin i' \, d\varepsilon$$

combinata cum $d\Omega' = \cos i' \, d\Delta + \cos\varepsilon \, d(\Omega - n)$, per reductiones obvias facile convertitur in:

$$d\Delta = \frac{\cos\Omega' \sin\varepsilon}{\sin i'} d(\Omega - n) + \frac{\sin\Omega'}{\sin i'} d\varepsilon.$$

II.

Mutationes differentiales longitudinis ac latitudinis geocentricae distantiaeque curtatae.

Referendo locum corporis coelestis atque terrae in spatio secundum Gaussii Theoriam mot. ad tria plana, sit scilicet primum planum ecliptica, secundum et tertium polos suos habeant in longitudine N et N + 90°, si

corporis coelestis longit. heliocentrica λ, longit. geocentrica l,

latitudo heliocentr. β, latitudo geocentr. b,

distantia a Sole r, a terra Δ;

terrae longitudo heliocentrica L, latitudo heliocentr. B,

distantia a Sole = R

eodem modo ut in Theor. mot. significabitur, ponendo adhuc $r' = r\cos\beta$, $\Delta' = \Delta\cos\beta$, $R' = R\cos B$, facile inter locum heliocentricum et geocentricum colligimus, esse:

[ξ] $\Delta' \cos(l - N) = r' \cos(\lambda - N) - R' \cos(L - N)$

[ζ] $\Delta' \sin(l - N) = r' \sin(\lambda - N) - R' \sin(L - N)$

[σ] $\Delta' \tang b = r' \tang\beta - R' \tang B$.

Evolutionem formularum [ξ] et [ζ] iam Sniadecius dedit. Consul. v. Sniadecki's sphärische Trigonometrie etc., übersetzt von L. Feldt pag. 130. Demonstrationem formulae [σ] propter facilitatem omittimus.

Porro sol proiectionesque loci corporis coelestis atque loci terrae, triangulum planum in plano eclipticae formabunt, cuius latera sunt Δ', R', r', angulique oppositi $\lambda - L$, $l - \lambda$, $180^\circ - l + L$, vel $L - \lambda$, $\lambda - l$, $180^\circ - L + l$. His praemissis, iam mutationes differentiales quantitatum l, Δ', b e mutationibus ipsarum λ, r', β ita inveniuntur.

1. Relationes trianguli plani

$$R' \sin(\lambda - L) = \Delta' \sin(l - \lambda),$$

$$R' \sin(180^\circ - l + L) = r' \sin(l - \lambda),$$

$$r' \sin(\lambda - L) = \Delta' \sin(180^\circ - l + L)$$

differentiando, sed spectando R′ et L tanquam quantitates constantes, aequationes praeced. hancce formam induunt:

$$[\mu] \quad R' \cos(\lambda - L)\, d\lambda = \Delta' \cos(l - \lambda)\, dl - \Delta' \cos(l - \lambda)\, d\lambda + \sin(l - \lambda)\, d\Delta'$$

$$[\nu] \quad -R' \cos(180^\circ - l + L)\, dl = r' \cos(l - \lambda)\, dl - r' \cos(l - \lambda)\, d\lambda + \sin(l - \lambda)\, dr'$$

$$[\omega] \quad r' \cos(\lambda - L)\, d\lambda = \sin(180^\circ - l + L)\, d\Delta' - \Delta' \cos(180^\circ - l + L)\, dl - \sin(\lambda - L)\, dr'$$

Formulam $[\nu]$ sive $-[-R' \cos(l - L) + r' \cos(l - \lambda)]\, dl = \sin(l - \lambda)\, dr' - r' \cos(l - \lambda)\, d\lambda$ iam ope aequationis $[\xi]$, ubi angulus N omnino arbitrarius est, transformemus. Statuendo $N = l$, formula supra exhibita $[\xi]$ transit in: $r' \cos(\lambda - l) - R' \cos(L - l) = \Delta'$ sive $r' \cos(l - \lambda) - R' \cos(l - L) = \Delta'$. Hunc ultimum valorem introducendo in aequat. $[\nu]$, mutato signo et divisione facta per Δ' prodit:

$$dl = \frac{r' \cos(\lambda - l)}{\Delta'}\, d\lambda + \frac{\sin(\lambda - l)}{\Delta'}\, dr',$$

quae formula cum ea convenit, quam Cl. Gauss dedit in Theor. mot. pag. 61.

2. Eodem modo e formula $[\mu]$ sive

$$[R' \cos(\lambda - L) + \Delta' \cos(l - \lambda)]\, d\lambda = \Delta' \cos(l - \lambda)\, dl + \sin(l - \lambda)\, d\Delta',$$

loco $R' \cos(\lambda - L) + \Delta' \cos(l - \lambda)$ subrogatur r' ex aequatione $[\xi]$, statuendo $N = \lambda$, provenit:

$$r'\, d\lambda = \Delta' \cos(l - \lambda)\, dl + \sin(l - \lambda)\, d\Delta'.$$

Hinc eliminando dl adiumento aequationis inter dr', $d\lambda$, dl in art. praec. traditae, omnibus rite reductis, inter mutationes differentiales quantitatum Δ', r', λ emergit relatio Gaussiana:

$$d\Delta' = -r' \sin(\lambda - l)\, d\lambda + \cos(\lambda - l)\, dr'.$$

3. E differentiatione aequationis $[\sigma]$, spectando R′ et B ut quantitates constantes, protinus deducitur

$$\frac{r'\, d\beta}{\cos^2 \beta} + \tang \beta\, dr' = \Delta' \frac{db}{\cos^2 b} + \tang b\, d\Delta'.$$

atque in hac aequatione subrogatus valor ipsius $d\Delta'$ ex art. 2. formulam inter $d\beta$, $d\lambda$, dr' et db exhibebit sequentem:

$$db = \frac{r' \cos^2 b}{\Delta' \cos^2 \beta}\, d\beta + \frac{r' \sin b \cos b \sin(\lambda - l)}{\Delta'}\, d\lambda + \frac{\cos^2 b}{\Delta'}\,[\operatorname{tang} \beta - \cos(\lambda - l) \operatorname{tang} b]\, dr'.$$

His adiungo, quae facile e praecedentibus sequuntur, adhuc relationes:

$$d\lambda = \frac{\Delta' \cos(l - \lambda)}{r'}\, dl + \frac{\sin(l - \lambda)}{r'}\, d\Delta',$$

$$dr' = -\Delta' \sin(l - \lambda)\, dl + \cos(l - \lambda)\, d\Delta',$$

$$d\beta = \frac{\Delta' \cos^2 \beta}{r' \cos^2 b}\, db + \frac{\Delta' \sin \beta \cos \beta \sin(l - \lambda)}{r'}\, dl + \frac{\cos^2 \beta}{r'}\,[\operatorname{tang} b - \operatorname{tang} \beta \cos(l - \lambda)]\, d\Delta'.$$

Sed satis sint hactenus dicta. Valete Commilitones rebusque Vestris diligenter prospicite.

D. BRUNSBERGAE, in Lyceo Regio Hosiano, mense Jul. exeunte MDCCCXXXI.

LECTIONES

A. ORDINIS THEOLOGICI.

JO. BERN. JOS. BUSSE, Dr. P. P. O.

I. Historiam ecclesiae christianae priorum quatuor saeculorum docebit diebus Lunae, Martis et Mercurii hora VIII—IX.

II. Juris canonici institutiones tradet diebus Jovis, Veneris et Saturni hor. VIII—IX.

III. Historiam conciliorum priorum saeculorum tradet diebus Lunae, Martis et Mercurii hora X—XI.

IV. Linguae hebraicae institutiones tradet diebus Jovis, Veneris et Saturni hora X—XI.

JOS. SCHEILL, Dr. P. P. O. h. t. DECANUS.

I. Introductione in theologiam pastoralem praemissa, partes disciplinae theologico-practicae, quae curam animarum et liturgiam, porro regulas prudentiae in vita publica et privata a Sacerdote observandas, ac demum doctrinam de administratione bonorum ecclesiasticorum complectuntur ducibus Sailer et Gollowitz unacum constitutionibus synodalibus, litteris pastoralibus dioecesis Varmiensis et ordinationibus, quae huc spectant, a gubernio politico editis, quotidie, excepto Sabbato, hora VIII-IX. tradet.

II. Repetitiones de rebus paedagogicis diebus Martis, Mercurii et Veneris hora II—III instituet, quas

III. Repetitiones de rebus theologicis iisdem diebus et hora sequentur.

IV. Exercitia liturgiae practicae in Seminario moderabitur diebus et horis assignandis.

JOS. NEUMANN, P. P. O. h. t. RECTOR.

I. Doctrinam de Gratia et Sacramentis duce Em. Salomone exponet diebus Lunae et Jovis hor. XI—XII., Mercurii et Saturni hor. IX—X.

II. Theologiam generalem praemissa introductione duce Em. Salomone tradet diebus Lunae, Martis, Jovis et Veneris hora IX—X.

III. Ethicam christianam communem et particularem duce „Riegler Christliche Moral nach der Grundlage der Ethik des Maurus v. Schenkl" docebit diebus Martis, Mercurii, Veneris et Saturni hora XI—XII.

Licentiat. DEMME lectiones, cum advenerit, indicabit.

B. ORDINIS PHILOSOPHICI.

MAR. GID. GERLACH, Dr. P. P. O.

I. De studiis philosophicis disseret die Lunae h. XI—XII.

II. Historiam philosophiae antiquae tradet diebus Martis et Veneris h. II-III.

III. Historiam aevi medii docebit, diebus Mercurii, Jovis et Saturni h. II-III.

LAUR. FELDT, Dr. P. P. O. h. t. DECANUS.

I. Historiam et naturam Disciplinarum Mathematicarum inde ab antiquo aevo usque ad nostra tempora adumbrabit, die Mercurii et Saturni hora XI—XII.

II. Arithmeticam universalem et Algebram docebit diebus Lunae, Martis et Veneris, hora XI—XII.

III. Stereometriam, trigonometriam planam et trigonometriam sphaericam secundum librum: v. Sniadecki's sphärische Trigonometrie etc. übersetzt von L. Feldt, Leipzig 1828, hora III—IV. diebus Lunae et Jovis.

IV. Geometriam sublimiorem secundum librum a Cel. Brandes editum, qui inscribitur: Lehrbuch der höhern Geometrie in analytischer Darstellung, illustrabit diebus Martis, Mercurii et Veneris, hora III—IV.

V. Physicae experimentalis partes speciales exponet, diebus Lunae, Jovis et Veneris, hora X—XI.

ORDO LECTIONUM CHRONOLOGICUS.

I. LECTIONES ANTEMERIDIANAE.

HORA.	LECTIONES THEOLOGICAE.	LECTIONES PHILOSOPHICAE.
VIII — IX.	Historia ecclesiastica, Dr. BUSSE 3. Juris canonici institutiones Dr. BUSSE 3. Theologia pastoralis etc. Dr. SCHEILL 5.	
IX — X.	Doctrina de Gratia et Sacramentis, NEUMANN 2. Theologia generalis, NEUMANN 4.	
X — XI.	Historia conciliorum, Dr. BUSSE 3. Lingua hebraica, Dr. BUSSE 3.	Physica experimentalis, Dr. FELDT 3.
XI — XII.	Doctrina de Gratia et Sacramentis, NEUMANN 2. Ethica christiana, NEUMANN 4.	Historia Disciplinarum Mathematicarum, Dr. FELDT 2. Arithmetica univers. et Algebra, D. FELDT 3. De studiis philosophicis, Dr. GERLACH 1.

II. LECTIONES POMERIDIANAE.

II — III.	Repetitiones de rebus theol. Repetitiones de rebus paedagog. } Dr. SCHEILL 3.	Historia philosoph. antiq., Dr. GERLACH 2. Historia aevi medii, Dr. GERLACH 3.
III — IV.		Stereometria et trigonometr., Dr. FELDT 2. Geometria sublimior, Dr. FELDT 3.
adhuc definienda.	Exercitia liturgiae practicae in Seminario, Dr. SCHEILL.	

Pag. 4 in formula [β] loco [$\cos \Delta \sin (\Omega - n) \cos (180^{\circ} - i) \sin \Delta \cos (\Omega - n)$] $d(\Omega - n)$ leg. [$\cos \Delta \sin (\Omega - n) - \cos (180^{\circ} - i) \sin \Delta \cos (\Omega - n)$] $d(\Omega - n)$.